

Sem V Civil - CBCWS, Dec-18

(3 Hours)

(Total Marks: 80)

LL

- Note:** 1. Question number 1 is compulsory; attempt any three out of remaining five questions.
 2. Assume suitable data if required and mention it clearly.
 3. Draw neat sketches wherever necessary. Figure to the right indicates full marks.

1. Attempt any four.
 - (a) List the various types of cement indicating their use for different applications. [05]
 - (b) Explain in detail the advantages and disadvantages of high strength concrete. [05]
 - (c) State the physical and mechanical properties of steel fibers in concrete. [05]
 - (d) What do you understand by destructive, non-destructive and partial destructive tests on concrete? Give an example in each test. [05]
 - (e) Explain durability of concrete structure. Enlist the factors affecting the durability of concrete. [05]

2. (a) Why is water – cement (w/c) ratio so important in concrete? State the relationship between w/c ratio and workability. [04]
- (b) A light weight concrete mix is required for structural concrete work. A minimum 28 days cube strength of 25 MPa is required based on structural considerations. [06]
 Mean Design Strength: 34 N/mm^2
 The relative density of the concrete, not to exceed a value of 1.85.
 Workability required is medium to high.
 Available aggregates are Foamed slag & Aglite.
 Design the most economical mix and set out the dry batch weights and also the field mix quantities per cubic meter of concrete, if the fine and coarse aggregates contain 4 & 2.5 percent of moisture by dry weight, respectively. Refer figure 1-3.
- (c) Define hot weather concreting. What are the effects of hot weather on concrete? What are the precautions to be taken during hot weather concreting? [10]

3. (a) Enlist the various factors required for mix design IS 10262:2009. Explain the step by step method for a mix design (with fly ash) as per IS 10262:2009. [10]
- (b) Write a short note on probe penetration test. Explain how the result is interpreted to check the quality of concrete? [10]

4. (a) State the effect of interaction between fibers and cement paste in cracked and uncracked matrix. [05]
- (b) Explain how Maturity method is used for determining the strength of concrete with suitable sketch. [05]
- (c) Define mass concrete. What are the problems faced during mass concreting? Explain the remedial measures to overcome the effects of mass concreting. [10]

5. (a) Explain the procedure of American Concrete Institute method of mix design 211.1 for air entraining concrete. [08]
- (b) What is pull out test? Explain its suitability and procedure. [08]
- (c) What do you understand by Rapid hardening cement? Why that is rapid rate of strength gain? [04]

6. (a) State the properties of polymeric and glass fibers in fiber reinforced concrete. [05]
- (b) Explain the effect of alkali aggregate reaction on concrete. [05]
- (c) What is corrosion? State the causes of corrosion. Enlist the methods to curb corrosion. [10]
 Explain any one method in detail.

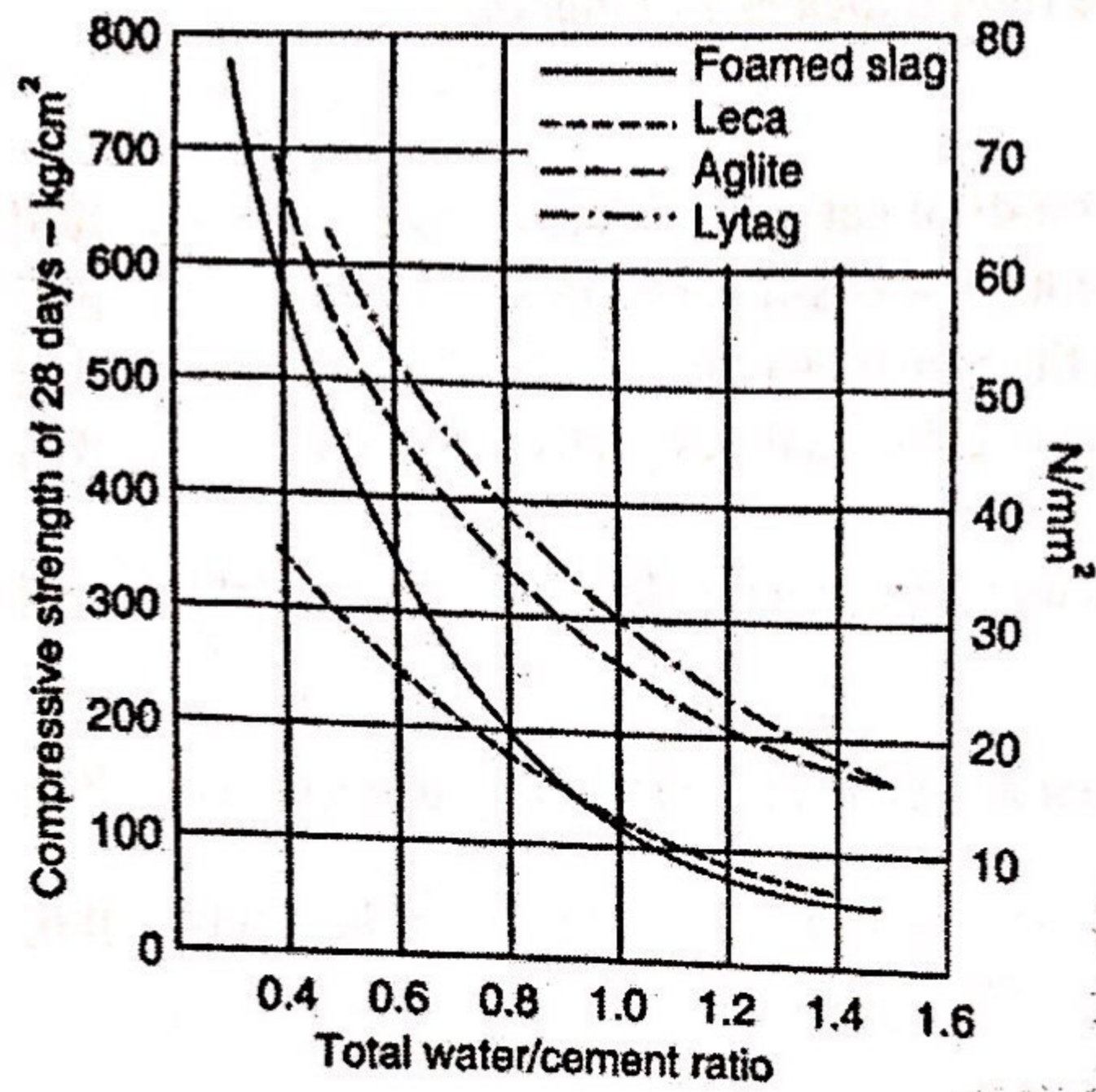


Figure 1 Relationship between the compressive strength of water stored cubes and total w/c

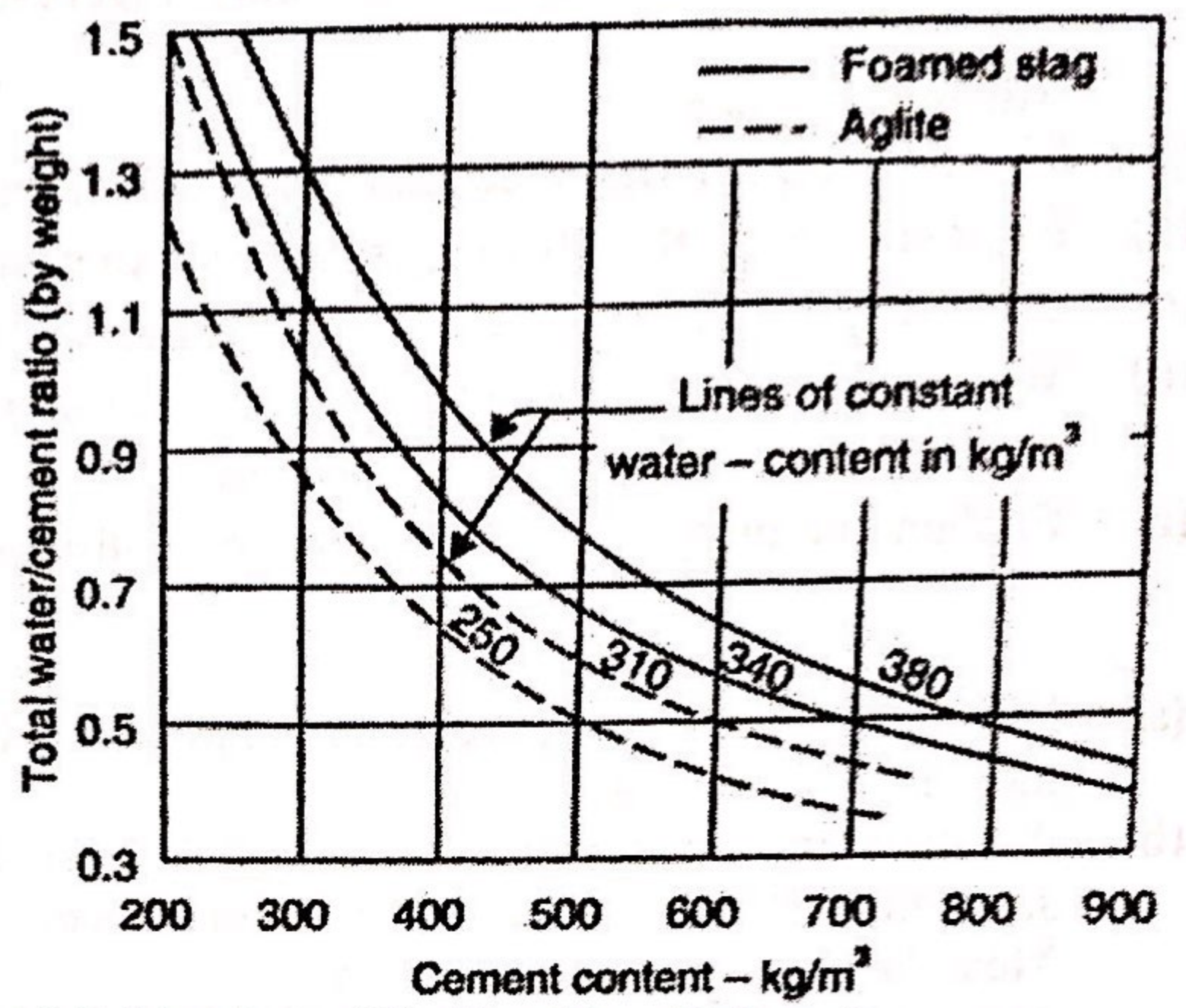


Figure 2 Relationship between the total w/c and the cement content

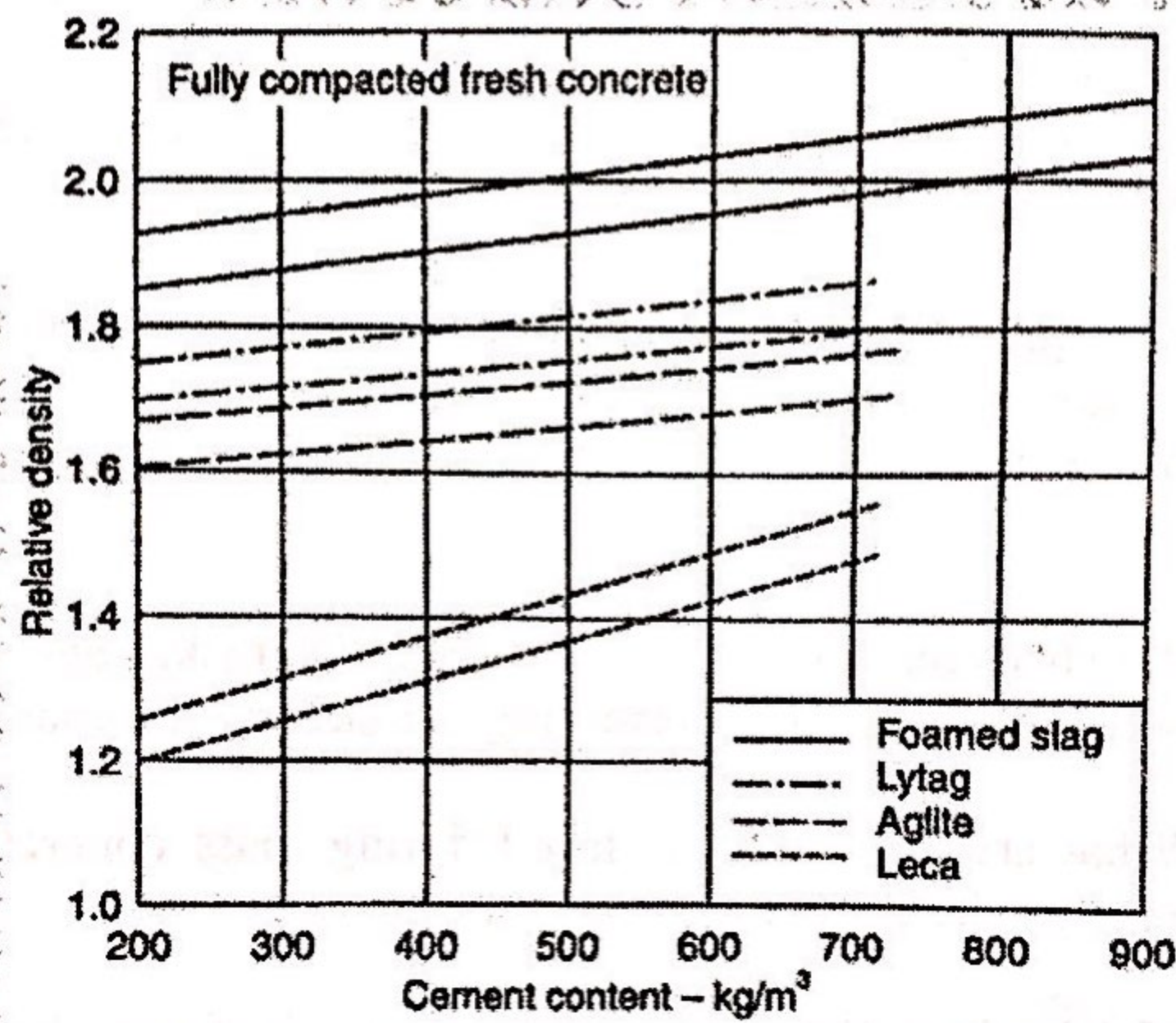


Figure 3 Relationship between the relative density & cement content for fully compacted fresh concrete

(3 hours)

Total marks: 80

N.B.: (1) Question no.1 is compulsory.

(2) Attempt any 3 questions out of the remaining 5 questions.

(3) Assume data wherever necessary and clearly mention the assumptions made.

(4) Draw neat figures as required.

- Q1 Solve any four from the following 20**
- Explain moment of momentum equation and its practical applications.
 - What do you understand by scale effect in models?
 - Write a short note on the unit quantities of a turbine.
 - What is meant by multistaging of pumps?
 - Show that maximum efficiency of propulsion is 50% when the inlet orifices are at right angles to the direction of motion of ship.
 - Explain the working principle of hydraulic accumulator.
- Q2 a A lawn sprinkler has two nozzles of diameters 3 mm each is connected across a tap of water. The nozzles are at distance of 40 cm and 30 cm from the centre of the tap. The rate of flow of water through the tap is $100 \text{ cm}^3/\text{s}$. The nozzles discharge water in the downward directions. Determine the torque required to hold the rotating arm stationary. Also determine the angular speed at which the sprinkler will rotate free. 10**
- b. 250 litres/s of water is flowing in a pipe having a diameter of 300 mm. If the pipe is bent by 135 degrees, find the magnitude and direction of the resultant force on the bend. The pressure of flowing water is 39.24 N/cm^2 . 10**
- Q3 a Derive on the basis of dimensional analysis suitable parameters to present the thrust developed by a propeller. Assume that the thrust P depends on the angular velocity ω , speed of advance V, diameter D, dynamic viscosity μ , mass density ρ , elasticity of the fluid medium which can be denoted by the speed of the sound in the medium C. 10**
- b A 7.2 m height and 15 m long spillway discharges $94 \text{ m}^3/\text{s}$ discharge under a head of 2.0 m. If a 1:9 model of this spillway is to be constructed, determine model dimensions, head over spillway model and the model discharge. If model experiences a force of 7500 N (764.53 kgf), determine force on the prototype. 10**

TURN OVER

Q.P. Code: 25343

- Q4 a** A jet propelled boat, moving with a velocity of 5 m/s, draws water amid-ship. The water is discharged through two jets provided at the back of the ship. The diameter of each jet is 150 mm. The total resistance offered to the motion of the boat is 4905 N. Determine (i) Volume of water drawn by the pump per second. (ii) Efficiency of the jet propulsion. **10**
- b** A jet of water having a velocity of 20 m/s strikes a curved vane, which is moving with a velocity of 10 m/s. The jet makes an angle of 20 degrees with the direction of motion of vanes at inlet and leaves at an angle of 130 degrees to the direction of motion of vanes at outlet. Calculate (i) Angle of vanes at inlet and outlet so that the water enters and leaves the vane without shock. (ii) Work done per second/unit weight of water striking the vanes per second. **10**
- Q5 a** A Pelton wheel is to be designed for the following specifications: Shaft power = 11,772 kW; Head = 380 meters; Speed = 750 r.p.m.; Overall efficiency = 86%; Jet diameter not to exceed one sixth of the wheel diameter. Take $K_{v1} = 0.985$ and $K_{u1} = 0.45$. Determine: (i) The wheel diameter (ii) The number of jets required (iii) Diameter of the jet **10**
- b** A Kaplan turbine runner is to be designed to develop 9100kW. The net available head is 5.6m. If the speed ratio = 2.09, flow ratio = 0.68, overall efficiency 86% and the diameter of the boss is 1/3 the diameter of runner. Find the diameter of the runner, its speed and the specific speed of the turbine. **10**
- Q6 a** A centrifugal pump with 1.2 m diameter runs at 200 r.p.m and pumps 1880 lps, the manometric head being 6 m. The angle which the vanes make at exit with the tangent to the impeller is 26° and the radial velocity of flow is 2.5 m/s. Determine the manometric efficiency and the least speed to start pumping against a head of 6 m, the inner diameter of the impeller being 0.6 m. **10**
- b** Write short notes on (i) Hydraulic press (ii) Hydraulic intensifier **10**

-----XXX-----

- Note**
- i. Question number 1 is compulsory.
 - ii. Solve any three questions of remaining.
 - iii. Assume data wherever necessary and clearly mention.
 - iv. Draw neat sketches as needed.

- Q1 Solve any FOUR** 20
- a What are merits of distorted models
 - b Write a note on surface profiles in open channel.
 - c Derive condition for most economical rectangular section
 - d Derive expression for unit power of turbine
 - e Write a note on hydroelectric power plant layout
 - f Write a note on multistage pumps
- Q2**
- a A pipe of 300 mm diameter conveying 0.30 m³/s of water has a right angles, bend in a horizontal plane. Find the resultant force exerted on the bend if the pressure at inlet and outlet of the bend are 24.525 N/cm² and 23.544 N/cm². 10
 - b Show by dimensional analysis, that the power P developed by a hydraulic turbine is given 10
by:

$$P = \rho N^3 D^5 f \left[\frac{N^2 D^2}{gH} \right]$$

Where ρ is mass density of liquid, N is rotational speed, D is the diameter of runner, H is working head and g is gravitational acceleration.
- Q3**
- a At a particular hydroelectric solution, the available head is 60 m and it is estimated that a discharge of 30 m³/s will be available. It is proposed to install Francis turbine of specific speed 215 and these are to run at 550 rpm with an overall efficiency of 85%. Make calculations for number of turbines and power available 10
 - b Find the power required to drive a centrifugal pump which delivers 0.04 m³/s of Water to a height of 20 m through a 15 cm diameter pipe and 100 m long. The overall efficiency of the pump is 70 % and coefficient of friction $f = 0.15$ in the formula $h_f = (4 f L V^2 / 2gd)$ 10
- Q4**
- a A 25mm diameter water jet exerts a force of 470 N in the direction of flow against a flat plate which is held inclined at angle 30 degree to axis of stream. Make calculation for flow rate of water 7
 - b In hydroelectric generating plant, there are four similar turbines of total output 220 MW. Each turbine is 90% efficient and runs at 100 rpm under head of 65m. Find flow rate of any one turbine 7
 - c Derive an expression for energy loss during hydraulic jump 6

- Q5** a The discharge of water through a rectangular channel of width 8 m is $15 \text{ m}^3/\text{s}$ when depth of flow of water is 1.2m. determine (1) specific energy of flowing water (2) Critical depth (3) critical velocity (4) minimum specific energy 10
- b 1 in 20 model of stilling basin, the height of hydraulic jump in the model is observed to be 20 cm. What would be corresponding height of jump in prototype. If energy dissipation in model is 0.1 KW, what would be the corresponding value in the prototype? 10
- Q6** a Derive condition for most economical circular section for maximum velocity 5
- b Differentiate between open channel flow and pipe flow 5
- c Derive expression for force exerted by jet on stationary curved plate when jet striking at centre 5
- d Write a note on NPSH 5

(4 Hrs.)

(Max.Marks:80)

- N.B.** (1) Question no.1 is compulsory
 (2) Answer any three(03) questions from the remaining questions
 (3) All questions carry equal marks

1. Draw **the plan of Hospital building** in city area, as **(G+1) R.C.C framed structure only** on PLOT of 50 m.x 55 m.

Requirements of the various units as per follows:-

1) Consulting Room	2 No. -each 20 m ²
2) Male Ward	-100 m ²
3) Female Ward	-100 m ²
4) Operation Theatre	-30 m ²
5) Special Rooms	3 No. - each 20 m ²
6) I.C.U	- 50 m ²
7) Pathology Lab	-20 m ²
8) Medical Store	-20 m ²
9) Administrative Unit	- 30 m ²
10) Nurse Room	-20 m ²

Provide adequate passage, staircase, sanitary units as per byelaws. Assume floor to floor height as **3.6 m** provide adequate passages, Staircases, Toilet/sanitary units as per the bye-laws. Draw the following according to some suitable scale.

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| (a) GROUND FLOOR PLAN | 15 |
| (b) Line Plan of First Floor | 05 |
| 2. Draw the Sectional Elevation for the building you have planned in Q.no.1 | 20 |
| 3. Draw the Two-point perspective for the building you have planned in Q.no.1 Assume the eye level at 2.2m. from Ground level . | 20 |
| 4. (a) Write detailed Principles of Town Planning | 10 |
| (b) Draw front elevation of the planned building in Q.1 | 10 |
| 5. Draw the One- point –perspective for a workshop with the following data :
Size of workshop = 5 m x 15 m
Height of workshop = 4m (excluding pitched Roof)
Eye level = 2m , from G.L
Plinth Level = 0.6 m from G.L | 20 |
| 6. (a) Draw the detailed foundation plan with a section of a one footing for the building, you have planned in Q.No.1 | 12 |
| (b) Write detailed notes on Modular planning | 08 |

58872

Sem V Civil - CBCRS, Dec-18

(03 Hours)

[Total marks:80]

Le

PLEASE NOTE:

1. Question No 1 is Compulsory.
2. Attempt any three questions out of remaining questions.
3. Figures to the right indicate full marks.
4. Illustrate answer with proper sketches.

- Q1 Write short notes on any four. 20
- a) Main advantages of escalators over other vertical circulation systems.
 - b) Measures of fire prevention in buildings.
 - c) Artificial light sources
 - d) Thermal protection coatings.
 - e) Effect of climate on concrete structures
 - f) Corrosion resistant steel.
 - g) Rebound hammer test
- Q2 a) Explain the design of modern lighting with examples. 10
- b) Explain different types of cracks and crack measurement techniques. 10
- Q3 a) Explain with proper sketches about "Causes of Deterioration" of concrete structure. 10
- b) Explain drainage systems in buildings with neat sketch. 10
- Q4 Write short notes on any four. 20
- a) Cathodic protection.
 - b) Causes of fire in buildings.
 - c) Types of wires
 - d) Septic tank
 - e) Factors affecting visual task
 - f) Polymer concrete
- Q5 a) What are the objectives of grouting? Explain various types of injection grouting. 10
- b) Write a note on destructive and non-destructive tests. 10
- Q6 a) Explain the procedure for conducting condition survey of an RCC structure. 10
- b) What are special construction features provided for elderly and handicapped persons 10

Dr. Patel

9029740909

12/2018

CC

(3 Hours)

[Total Marks: 80]

- NB :**
- 1) Question 1 is compulsory.
 - 2) Attempt any three questions from the remaining questions.
 - 3) Assume suitable data wherever applicable.

- | | | | |
|-----|---------------------------------|-------------------------------------------------------------------------------------------|----|
| Q1. | a | Explain the applications of virtual reality | 5 |
| | b | Explain parallel and perspective projections | 5 |
| | c | Explain the need for homogeneous matrix representation. | 5 |
| | d | Explain boundary filling and flood filling algorithm | 5 |
| Q2. | a | Explain Bresenham's line drawing algorithm. How it is different from DDA | 10 |
| | b | Define virtual reality. Explain the components of VR. | 10 |
| Q3. | a | Explain input and output devices used for virtual reality systems. | 10 |
| | b | Explain Sutherland Hodgeman polygon clipping. | 10 |
| Q4. | a | Define curve? How Bezier curve algorithm works? List out properties of the same. | 10 |
| | b | Explain graphics rendering pipeline. | 10 |
| Q5 | a | Explain 3D transformations i.e. translation, scaling, rotation, reflection with examples. | 10 |
| | b | Describe computer animation and the use of 2D and 3D morphing in it. | 10 |
| Q6. | Write short notes on (any four) | | 20 |
| | a. | VRML | |
| | b. | Color Models. | |
| | c. | Fractals | |
| | d. | Aliasing and Anti-aliasing | |
| | e. | Text clipping | |

(3 hours)

Marks : 80

N.B.

1. Question No 1 is compulsory
2. Attempt any three questions from the remaining five questions
3. Assume suitable data where ever required
4. Figures to the right indicate full marks

- | | | | |
|-----|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Q1. | a. | Explain the principle of sedimentation and the design parameters used. | 05 |
| | b. | Explain physical, chemical and biological impurities in water. | 05 |
| | c. | Write a note on rain water harvesting techniques. | 05 |
| | d. | Write a note on reverse osmosis. | 05 |
| Q2. | a. | Design a rectangular sedimentation tank to treat 5 MLD of water. Assume data wherever required and check for surface loading and weir loading | 10 |
| | b. | List the factors affecting the selection of site for intake structure. Also Draw a neat diagram of submerged intake structure. | 10 |
| Q3. | a. | Explain the process of coagulation and flocculation. Write about coagulant aids. | 10 |
| | b. | Draw a flow diagram showing sequence of various treatment units with river as a source. List these units sequentially state the function of each unit. | 10 |
| Q4. | a. | Define and Enlist different methods of water softening. Explain Zeolite process with neat Sketch | 10 |
| | b. | Explain different methods of disinfection and types of chlorination. | 10 |
| Q5. | a. | Design a rapid sand filter unit along with under drainage system for population of 200,000 which is to be served by a 200 l/head/day of water supply. Assume all the data and mention the same. | 10 |
| | b. | What are air pollutants and control measures for gaseous and particulate matter? Mention air quality standards. | 10 |
| Q6. | | Write short notes on (any four) | |
| | a. | Noise pollution and control | 05 |
| | b. | Fixture and Fittings of Building Water Supply | 05 |
| | c. | Aeration process and types | 05 |
| | d. | Slow sand filters | 05 |
| | e. | Water demands | 05 |
| | f. | Removal of iron and manganese. | 05 |

(3 Hours)

Marks : 80

- N. B.:
- (1) Question No. 1 is compulsory.
 - (2) Attempt any three from remaining five questions.
 - (3) Figures to the right indicate the full marks.
 - (4) Assume suitable data if not given and justify the same.

- Q. 1
- A. Write the characteristics of flow net. 05
 - B. Draw the plasticity chart and explain its use in classification of fine grained soil. 05
 - C. Define soil mechanics, geotechnical engineering, cohesive & cohesionless soil. 05
 - D. Write the use of compaction. 05
- Q. 2
- A. Establish the equation with parameters γ_d , n_a , G , γ_w and w . Notations have usual meaning. 05
 - B. Explain the shrinkage ratio, volumetric shrinkage and shrinkage index. 05
 - C. Derive expressions for horizontal and vertical equivalent permeability for a stratified soil deposit using usual notations. 10
- Q. 3
- A. A sample of clay with a weight of 6.7 N was coated with paraffin wax. The combined weight of clay and wax was found to be 6.78 N. The volume of wax coated sample was found by immersion in water to be 350000 mm³. The sample was then broken and moisture content was found to be 16%. If the G value of soil and wax are 2.67 and 0.89 respectively, determine the bulk unit weight, void ratio and degree of saturation of sample. 10
 - B. For the given data classify the following soils as per IS 1498: 10
 - (a) Liquid limit : 41%, Plastic Limit: 21%
 - (b) Liquid limit : 20%, Plastic Limit: 14%
 - (c) Passing 4.75 mm sieve = 71%, Passing 75 μ sieve = 9%, $C_u = 7$, $C_c = 2.9$, $I_p = 3$.

- Q. 4. A. A saturated specimen of cohesionless sand was tested in triaxial compression and the sample failed at a deviator stress of 482 kN/m^2 when the cell pressure was 100 kN/m^2 , under the drained conditions. Find the effective angle of shearing resistance of sand. What would be the deviator stress and the major principal stress at failure for another identical specimen of sand, if it is tested under cell pressure of 200 kN/m^2 10
- B. Explain the static cone penetration test. 05
- C. Explain the procedure to compute the pre-consolidation pressure using Cassagrand's method. 05
- Q. 5 A. From a Proctor's compaction test the maximum dry density was found to be 1.75 gm/cc and OMC 14.5% . The specific gravity of soil grains is 2.6 . 10
- (a) Find out the Degree of Saturation and percentage air voids at the optimum state.
- (b) A specimen 10 cm in diameter, 20 cm in height is to be prepared for triaxial test with same soil by static compaction to correspond to the optimum state. Find out the weights of the oven dried soil and water required for the specimen.
- B. A layer of soft clay is 5 m thick and lies under a newly constructed building. The weight of sand overlying the newly clayey layer produces a pressure of 260 kN/m^2 and the new construction increases the pressure by 100 kN/m^2 . If the compression index is 0.45 , compute the settlement. Water content is 40% and $G = 2.65$ 10
- Q. 6 A. In a falling head permeability test, head causing flow was initially 60 cm and drop 3 cm in 5 minutes . What will be the time required for the head to fall from 60 cm to 30 cm ? 05
- B. Explain the bore log with proper representation. 05
- C. Explain how to determine the liquid limit using Cassagrand's apparatus. 05
- D. Write the use of particle size distribution curve. 05

(Time: 3 Hours)

Max Marks: 80

- NB: 1) Question No. 1 is compulsory
 2) Attempt any 3 of the remaining 5 questions
 3) Assume suitable data wherever necessary
 4) Numbers to right indicate full marks.

1. Answer any 4:
- a) Explain the importance of field exploration in geotechnical engineering. 05
 - b) Write a short note on Atterberg limits. 05
 - c) What are the limitations of sedimentation analysis. 05
 - d) Derive the expression for average coefficient of permeability of stratified soil deposits when the flow is parallel to the planes of stratification. 05
 - e) Explain the factors affecting compaction? 05
2. a) Using three phase diagram, derive the expression for submerged density in terms of voids ratio. 05
 b) For the construction of an embankment, the soil is transported from the borrow area using a truck which can carry 5 m³ soil at a time. Determine i) the volume of soil to be excavated from the borrow pit and ii) the number of truck loads required to obtain 100 m³ compacted earth fill from the following details: 10

Property	Borrow Area	Truck	Field
Bulk Unit Wt.	17kN/m ³	12kN/m ³	19kN/m ³
Water Content	8.5%	6.5%	14.5%

- c) Write a short note on activity of clays. 05
3. a) The mass and volume of a saturated soil sample is 30.8 gm and 18.8 cc. respectively. On oven drying, the mass got reduced to 20 gm and volume to 9.9 cc respectively. Calculate the shrinkage limit, shrinkage ratio, volumetric shrinkage and specific gravity of the sample. 10
- b) Sieve analysis was performed on 1000 gm of dry soil sample and the following observations were made: 10

Sieve Size (mm)	20	10	4.75	2	1	0.6	0.425	0.3	0.212	0.15	0.075
Mass Retained (gm)	33	49	85	140	160	142	118	82	56	35	23

If the liquid limit and plasticity index of the sample is 15% and 20% respectively, classify the soil sample as per IS classification.

4. a) Write a short note on relative density. 05
 b) In a falling head permeability test on a soil sample of length 100 mm, the head of water in the stand pipe takes 10 seconds to fall from 850 mm to 175 mm above the tail-water level. Then another soil of length 60 mm is placed on top of the first soil. The time taken for the head to fall between the same limit is 18 seconds. The permeameter has a cross-sectional area of 5000 mm² and a stand pipe area of 150 mm². Calculate the permeability of the 2nd soil. 10
 c) Define: i) flow line, ii) equipotential line, iii) flow net, iv) field and v) flow channel. 05
5. a) A test well 0.5 m in diameter penetrates through a saturated aquifer 10 m thick overlying an impervious layer. The steady discharge of the well is 19.72 m³/hr. The drawdown at a distance of R₁ = 20 m from the centre of test well is found to be 1.9 m. What will be the drawdown at a distance of R₂ = 50 m, if the permeability of soil is 3.8 x 10⁻⁴ m/sec? Estimate approximate drawdown at the test well also. 10
 b) A sand stratum is 12 m thick. The water table is 4 m below ground level. The unit weight of sand layer above and below water table is 17.5kN/m³ and 21 kN/m³ respectively. The capillary rise above water table is 2m. Draw the effective stress, pore pressure and total stress diagram for the sand stratum. 10
6. a) The results of an IS Standard Proctor Test are as follows: 10

Trial No.	1	2	3	4	5	6
w (%)	9	11.1	13.9	14.3	16.3	16.7
ρ _d (gm/cc)	1.58	1.76	1.85	1.77	1.63	1.60

The specific gravity of soil particle is 2.65. Plot the following: a) moisture content - dry density curve, b) zero air voids curve and c) 10% air content curve. Determine the optimum moisture content and the corresponding maximum dry density.

- b) Explain the corrections made in standard penetration test. 05
 c) Write a short note on borehole logs. 05

(3 HOURS)

[TOTAL MARKS 80]

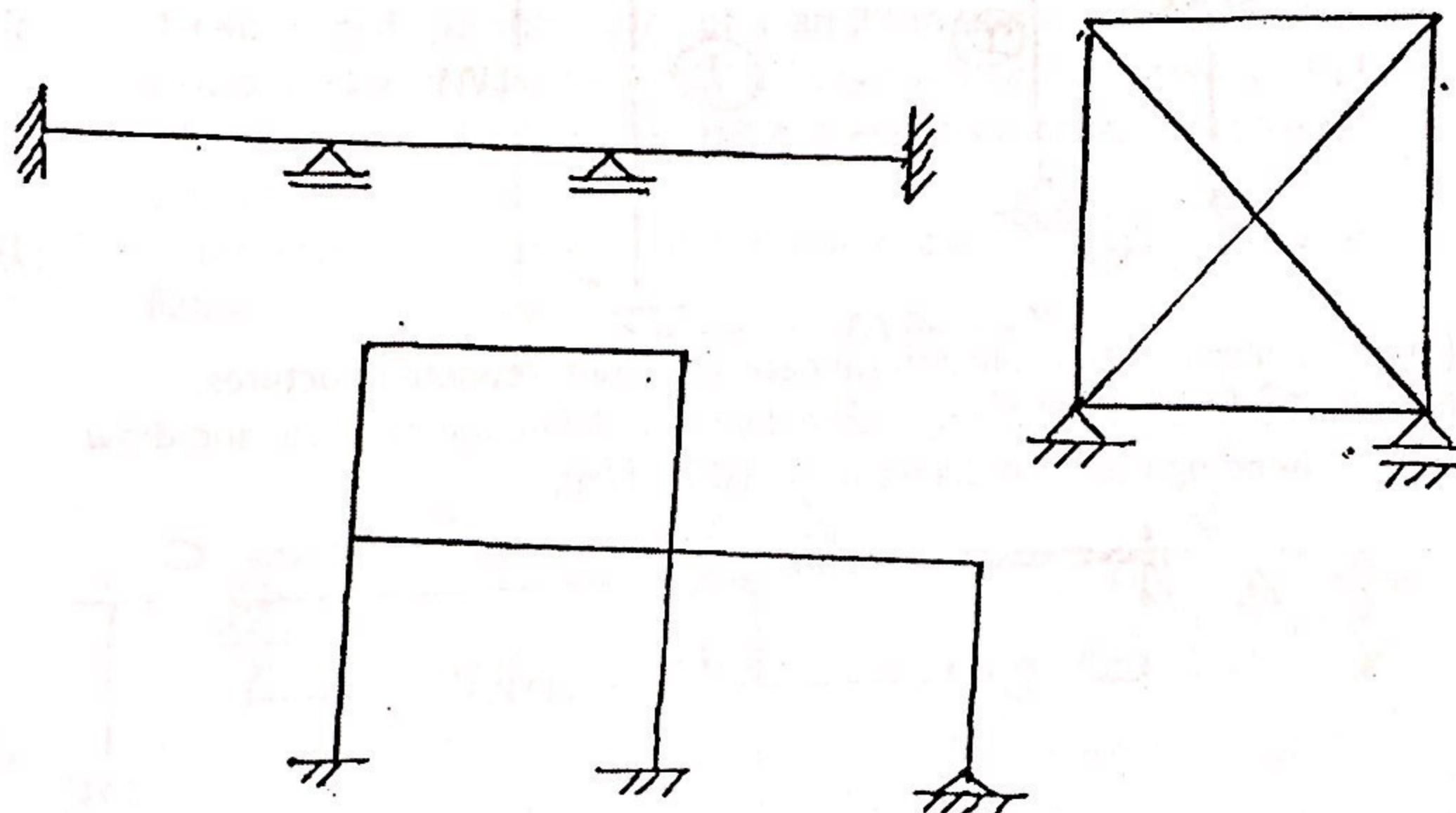
Please Note:

- 1) Question no 1 is compulsory
- 2) Attempt any three questions from remaining questions
- 3) Assume suitable data if required and justify the same.

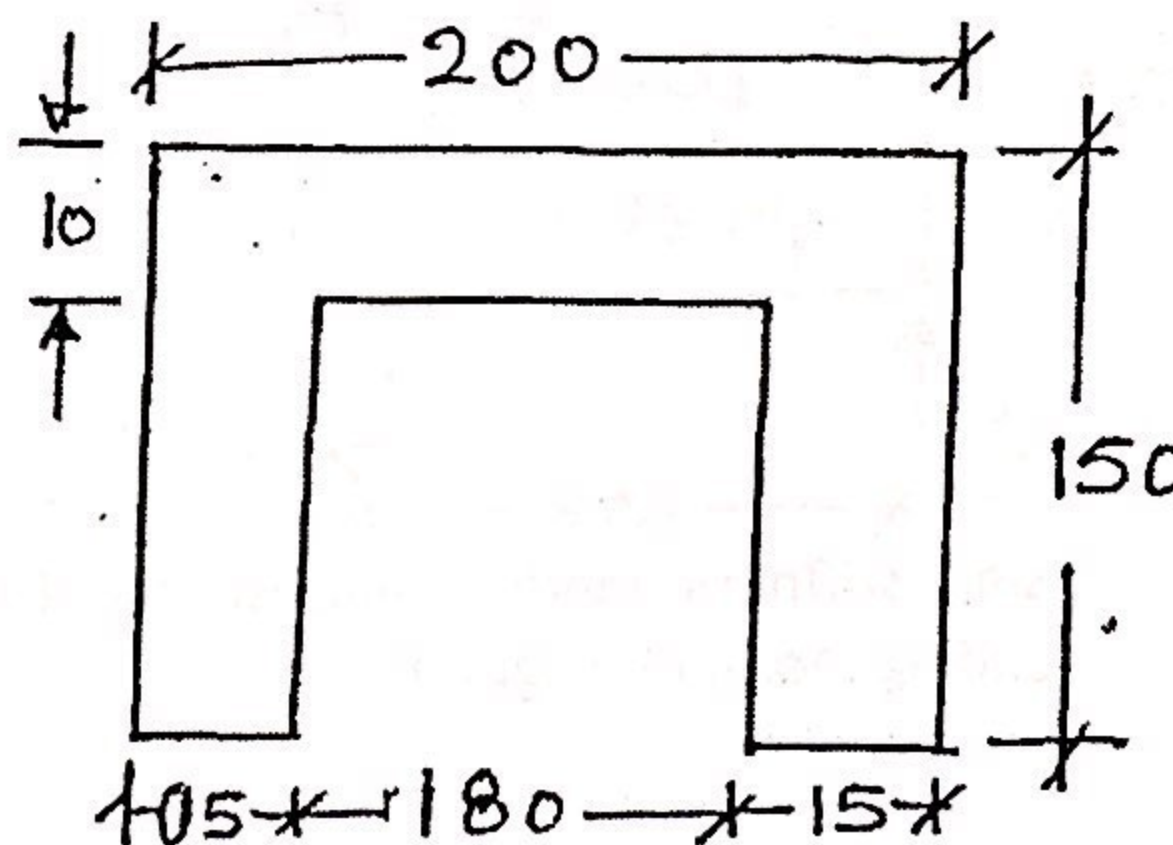
Q1.

Attempt following

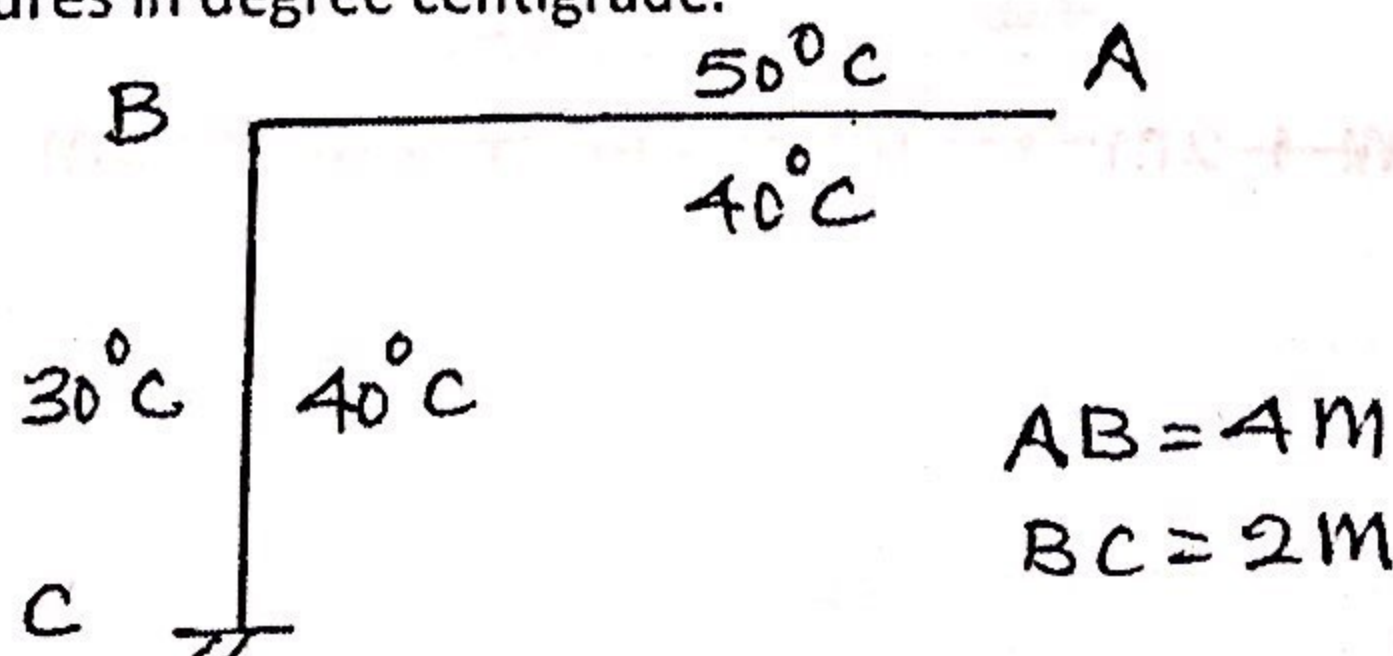
- (a) Find degree of static and kinematic indeterminacy of following structures 06



- (b) Find the shape factor of the section shown in following figure. 08

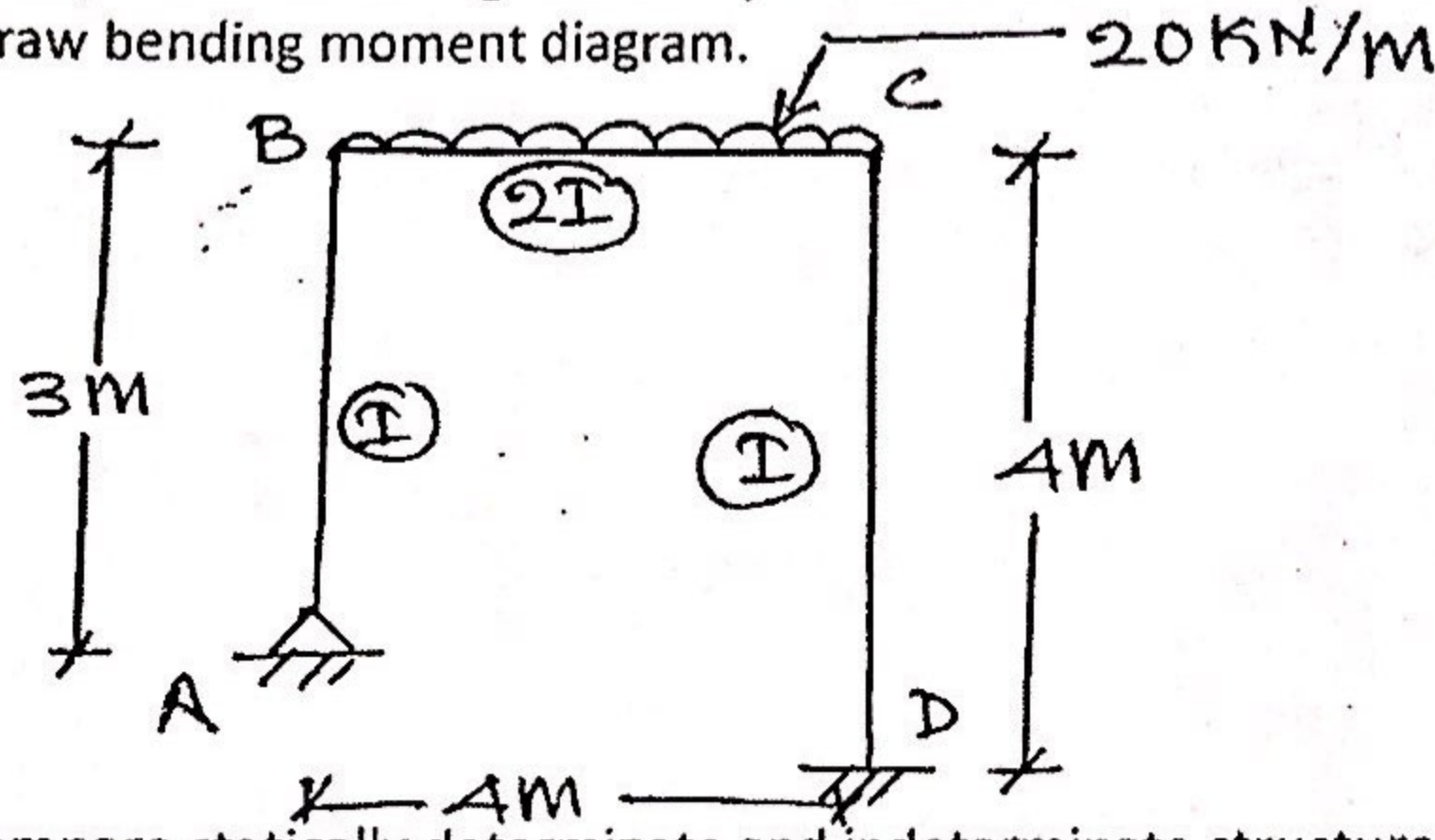


- (c) For the rigid frame subjected to temperature variation shown in figure. Find horizontal deflection at A. Assume depth of all members as 400mm. Take $\alpha = 12 \times 10^{-6} / ^\circ\text{C}$. All temperatures in degree centigrade. 06

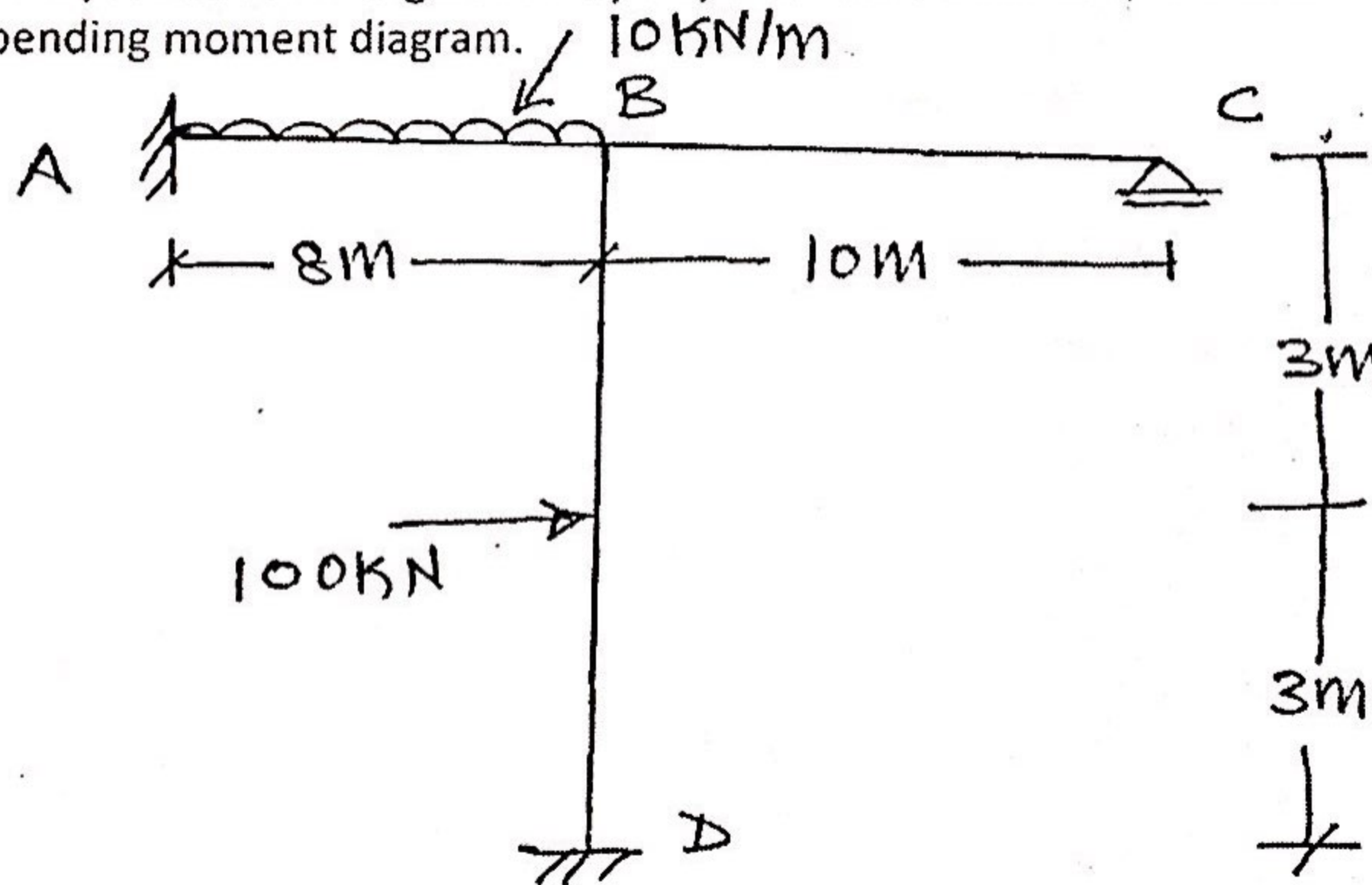


TURN OVER

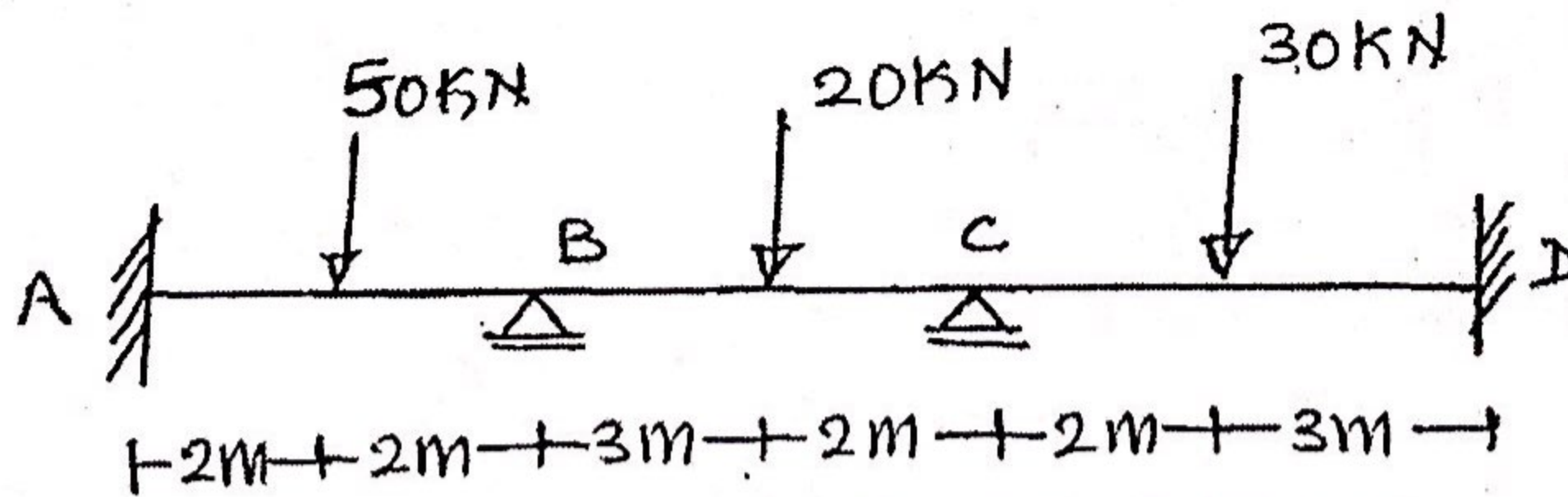
- Q2 (a) Explain the application of virtual method with suitable example. 05
 (b) Analyse the following frame by moment distribution method and draw bending moment diagram. 15



- Q3 (a) Compare statically determinate and indeterminate structures. 05
 (b) Analyse the following frame by slope deflection method and draw bending moment diagram. 15

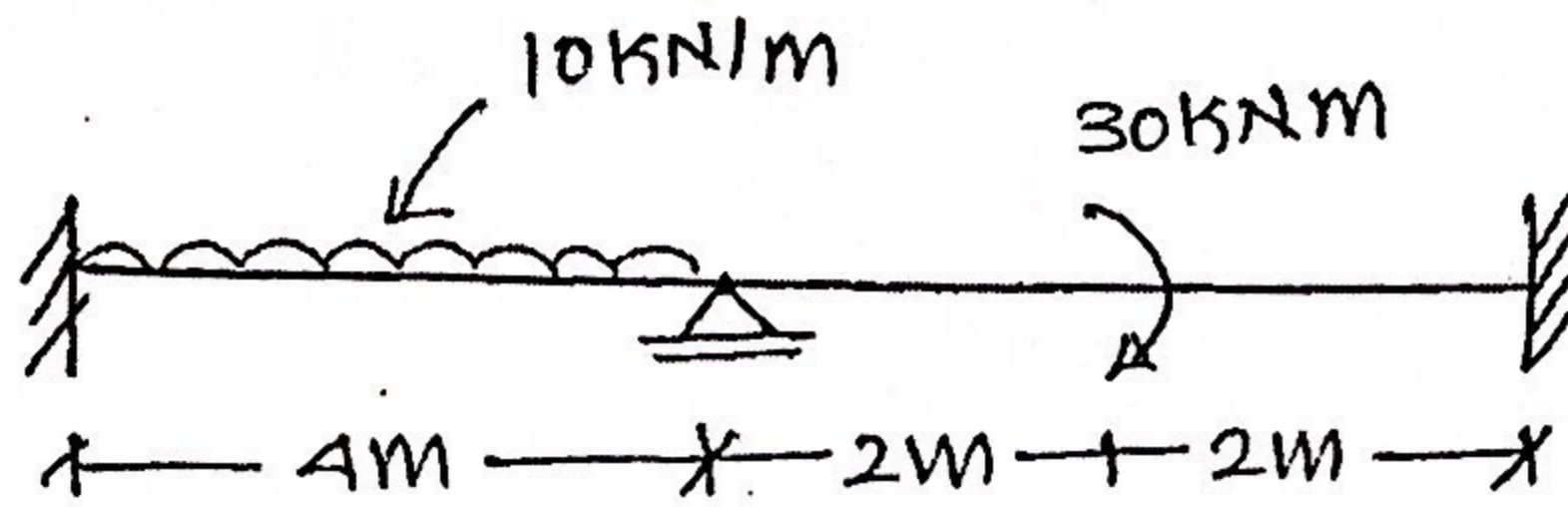


- Q4 (a) Using stiffness method analyse the following beam and draw bending moment diagram. 10



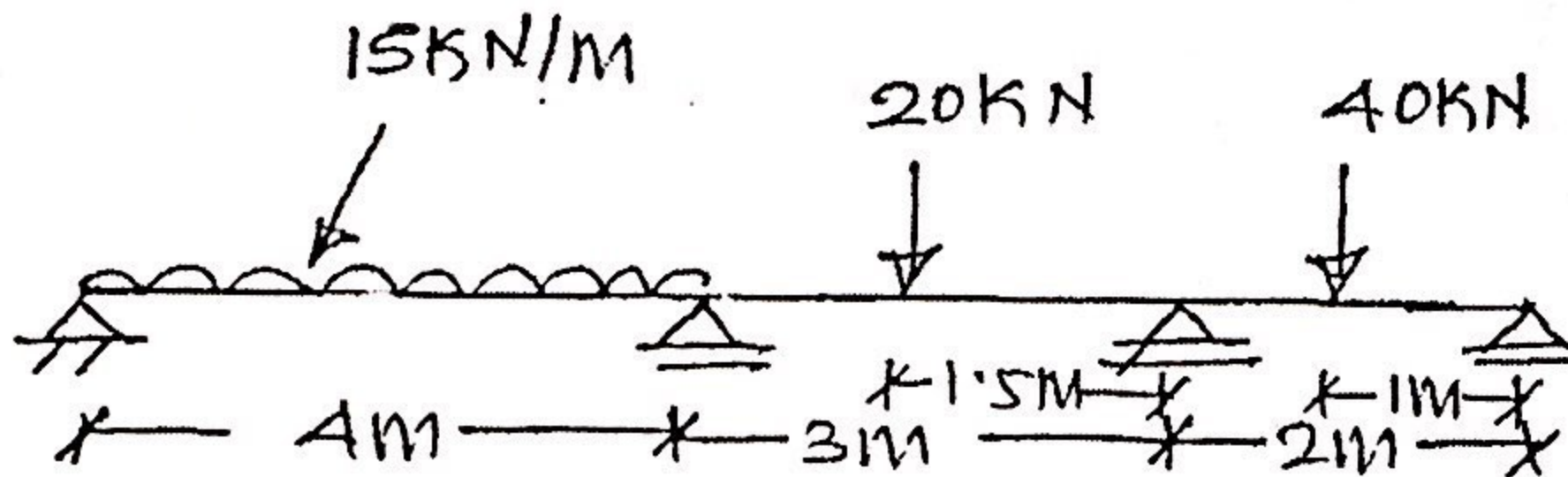
TURN OVER

- (b) Analyse the following beam using theorem of three moments and draw bending moment diagram. 10



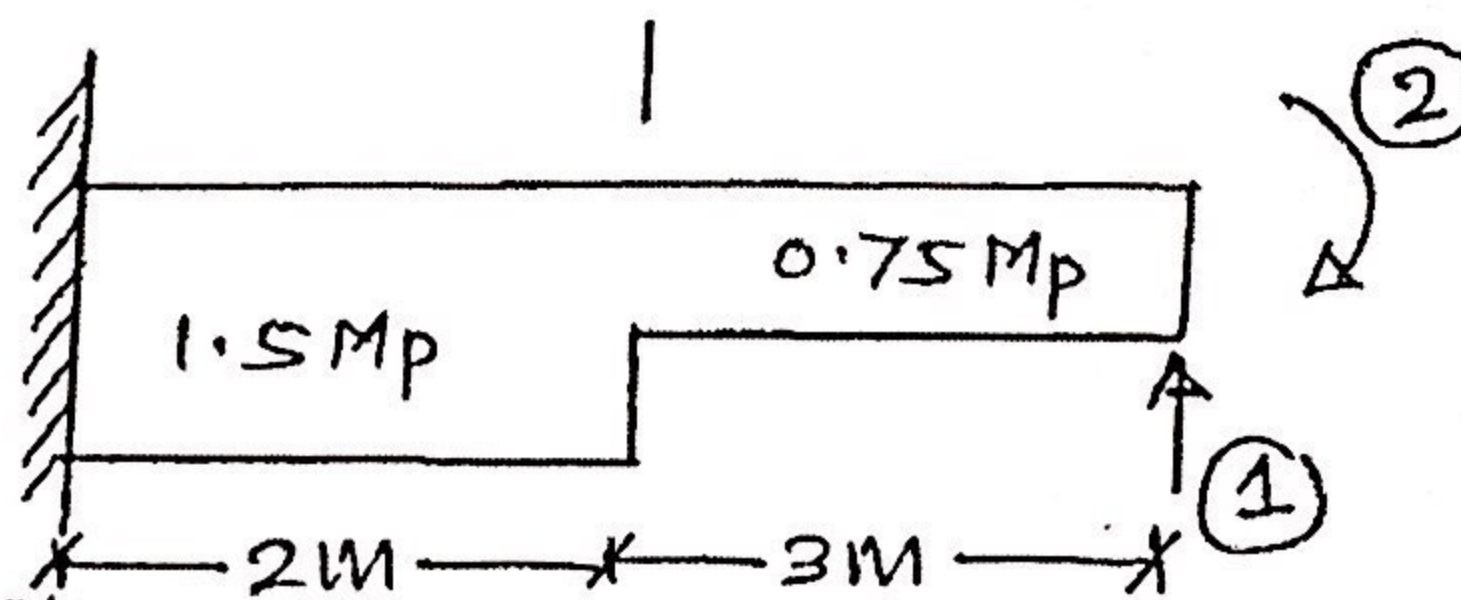
Q5

- (a) A two hinged parabolic arch of span 20 m and rise 6 m carries a UDL of 20 kN/m over the right half span and concentrated load of 75 kN at crown. Analyse the arch and draw bending moment diagram. 10
- (b) Determine the collapse load for the beam shown in following figure. 10



Q6

- (a) Develop flexibility matrix for the member shown in figure with reference to coordinates shown in figure. 10



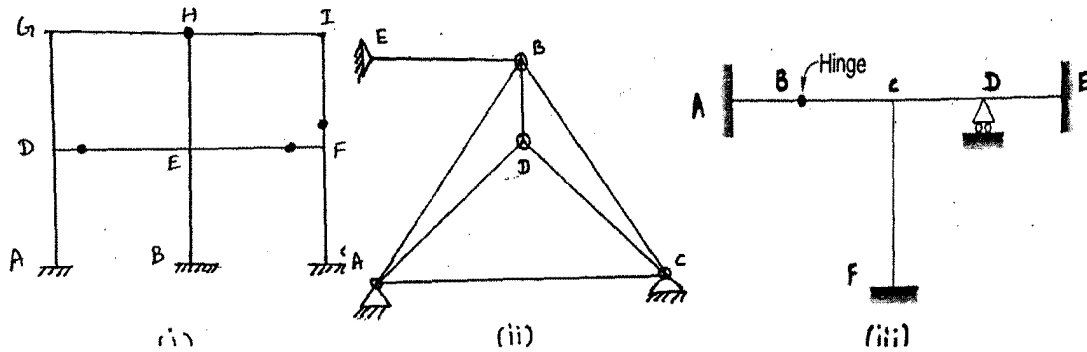
- (b) Explain following terms 10
1. Shape factor
 2. Carry over moment
 3. Distribution factor
 4. Anti symmetrical loading.

(3 Hours)

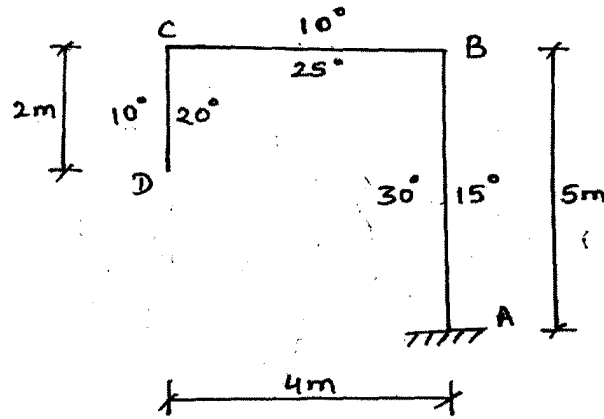
Max Marks: 80

- N.B** (1) Question No.1 is compulsory.
 (2) Attempt **any three** questions of the remaining five questions.
 (3) Assume suitable data if required.
 (4) Figures to the right indicate full marks.

- Q1.** a) For the structures shown below, determine
 i) Static indeterminacy (clearly indicating external and internal). (03)
 ii) Kinematic indeterminacy (consider axial rigidity of flexural members). (03)

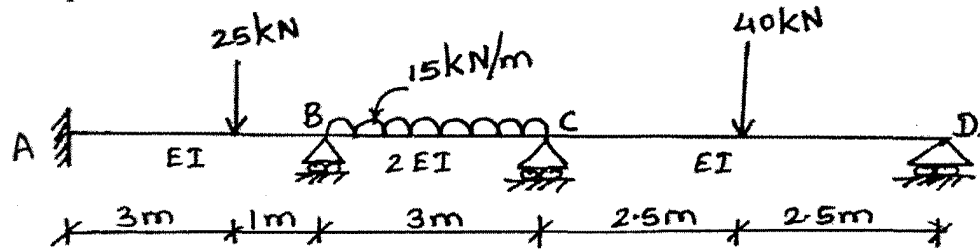


- b) For a rigid jointed frame subjected to temperature variation as shown in figure. Determine the horizontal deflection at 'D'. Assume depth of all members as 250 mm, neglect axial forces. Assume $\alpha = 12 \times 10^{-6} / ^\circ\text{C}$. (07)

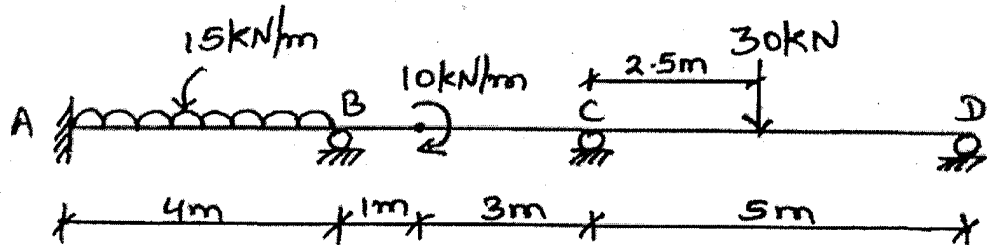


- c) Define flexibility and stiffness, and state the relation between them. (03)
 d) Define and explain distribution factor and carry over factor. (04)

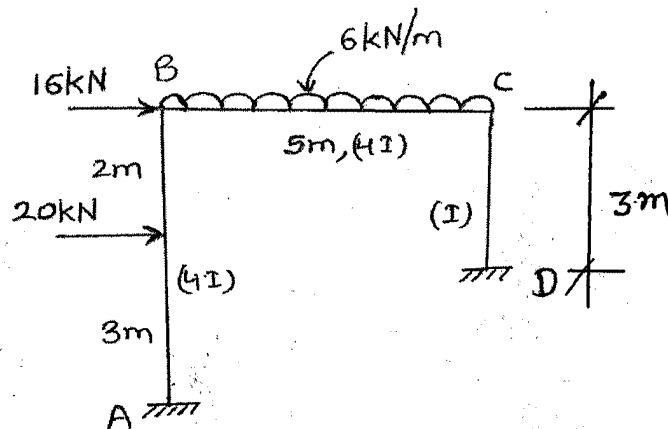
- Q2). a) Analyse the continuous beam shown in figure below by **Moment distribution method** or **Kani's method**. Note that Support 'B' sinks by 12 mm during loading. Draw BMD and deflected shape. Take $EI = 1600 \text{ kNm}^2$. (12)



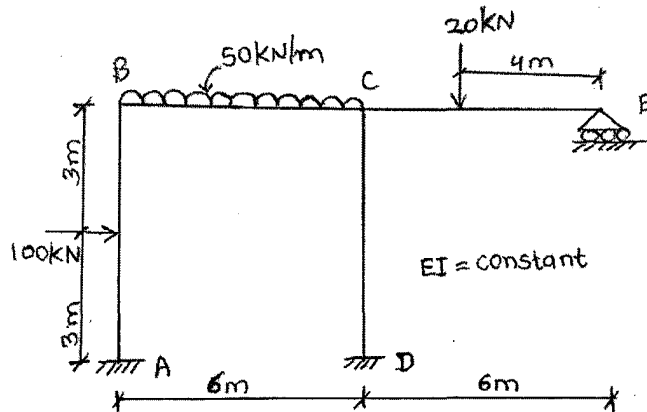
- b) Analyse the continuous beam shown in figure below by **Clapeyron's three moment theorem** or **Slope deflection method** and draw BMD. $EI = \text{constant}$. (08)



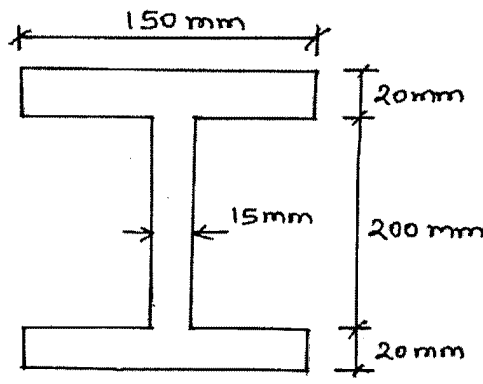
- Q3). Using **Flexibility matrix method** analyse the portal frame shown in figure below. Draw (20) BMD and deflected shape.



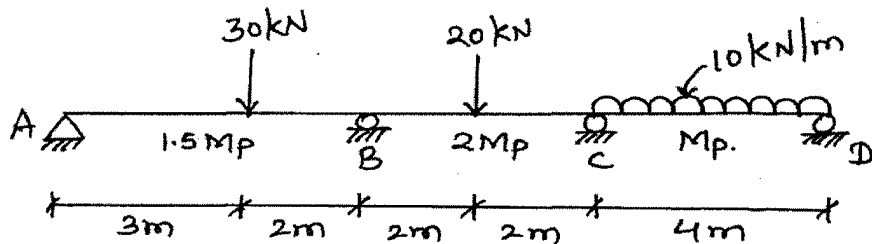
- Q4). Using **Stiffness matrix method**, analyse the given portal frame. Draw BMD and deflected shape. (20)



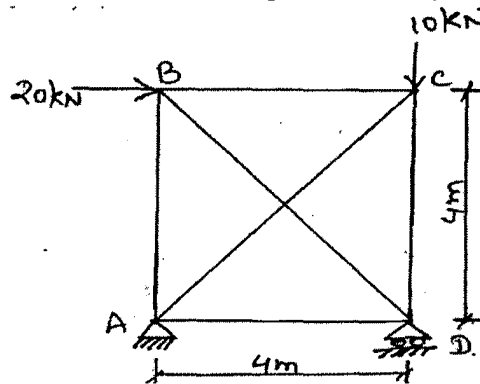
- Q5). a) Find the shape factor for the beam cross section shown in figure below and find ' M_p ', if $F_y = 250 \text{ N/mm}^2$. (04)



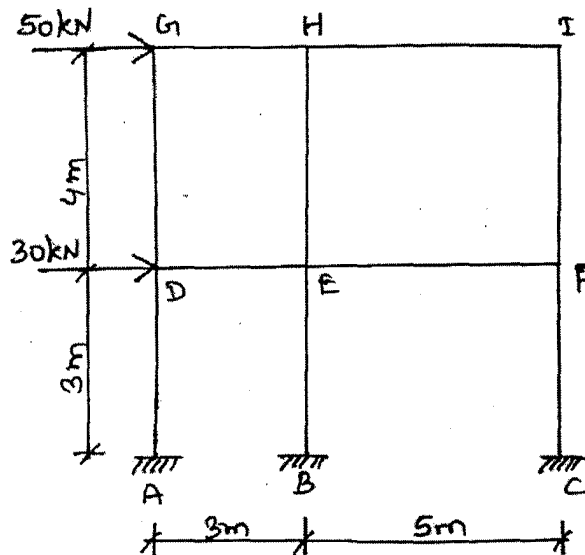
- b) Find the plastic moment capacity ' M_p ' for the continuous beam shown in figure below. (08)



- c) Analyse the pin jointed plane frame shown in figure below by force method. (08)



- Q6). a) Draw stress diagram of elastic state, elasto-plastic state and fully plastic state for a beam of (04)
 rectangular cross section.
 b) Derive an expression of horizontal thrust for two hinged parabolic arch subjected to UDL (06)
 throughout.
 c) Analyse the two storied frame structure laterally loaded as shown in figure using cantilever (10)
 method. Draw BMD and SFD.



- Note:**
- i. **Q. No. 1 is compulsory**
 - ii. Attempt **any 3** out of **remaining 5**
 - iii. Support all **theory and numerical** with **neat sketch**

1. A Calculate corrected runway length for basic runway length of 4100 meter at an airport site located at 150m above M.S.L. The airport reference temperature is 32.30° C and standard atmospheric temperature is 33.80° C. consider site is horizontal. Also draw layout of airport with scale of 1cm = 500m use corrected runway length. Take airport area of 4 km x 3 km and show all airport elements. Assume wind is calm in all the direction throughout the year. (10 M)

- B Write a note on (any 2) (10 M)
 - i Importance of water transportation in India.
 - ii Marshalling yard.
 - iii Classification of signals.

2. A Discuss characteristics of Concrete, Timber and cast-iron sleepers on basis of suitability, durability, cost and weight. (08M)
- B What are 3 controls of aircraft? (06 M)
- C Explain Tram-line method of laying railway line. (06 M)

3. A Explain Negative Super elevation with neat sketch and find the speed on main curve if a 5° curve diverges from a 3° main curve on a B.G yard assuming the speed of branch line is 35kmph. (08 M)
- B Discuss Instrumental landing system with sketch. (06M)
- C Write note on airport drainage. (06M)

4. A What is ANC and TNC? Design 1in 8.5 turnout on B.G track which takes off from toe and passes through TNC. Assume heel divergence as 11.4cm. (08 M)
- B Write a note on breakwaters. (06M)
- C Discuss on airport lighting. (06M)

5. A Design an exit taxiway connecting runway and parallel taxiway for total angle of turning as 35°. Turning speed is 80kmph, take coefficient of friction as 0.12. assume any other data if required. (08M)
- B Explain dry docks and also compare ports and harbor. (06 M)
- C Explain various theories of creep. (06 M)

6. A Design the number of gates to serve three classes of aircraft for obtaining Combined handling capacity of all the gates as 20 aircrafts per hour. Use following data, assuming that each gate is available for all the aircrafts class. assume any other data if required. (05 M)

Aircraft class	Mix (%)	Average Occupancy Time (min)
1	15	25
2	35	45
3	50	60

- B Write note on any 3
- i Types of rails.
- ii Konkan railway
- iii Dolphin
- iv Jetty and wharves
- v Classification of airport as per ICAO

(15 M)

(3 Hours)

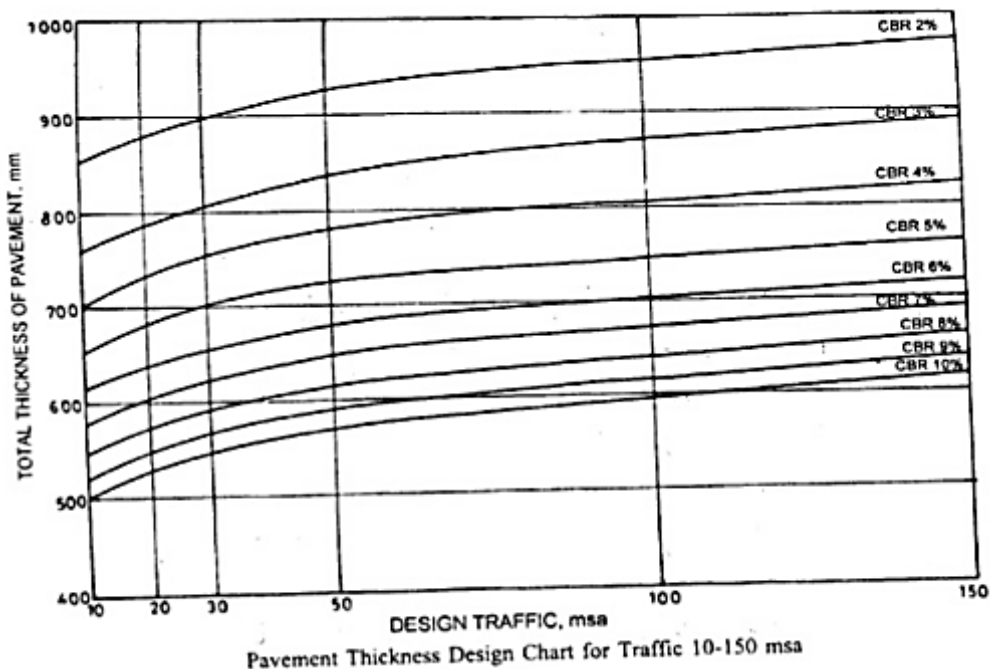
[Total Marks: 80

- Note:**
- i. Q. No. 1 is **compulsory**
 - ii. Attempt **any 3** out of remaining 5
 - iii. Support all **theory and numerical** with neat sketch

1. Solve any four (20 M)
 - A. Explain the classification of Urban roads
 - B. What is Overlay? Discuss on its types.
 - C. Explain Cement Stabilization
 - D. Determine the percentage of reduction in SSD if the road having 10% gradient is replaced with a levelled road. Assume design speed as 60 KMPH and $f=0.15$.
 - E. Compare SMS and TMS. Also, if the spot speeds are 50, 40, 60, 54, & 45, then find out Space Mean Speed and Time Mean Speed

2. A. For a pavement thickness of 26 cm & 12 tons single axle load, M40 grade of concrete, Radius of relative stiffness = 62.2 cm, $E = 2 \times 10^5 \text{ kg/cm}^2$, $Mc = 41500 \text{ kg/cm}^3$, width of joint (z) = 1.8 cm, Design the Dowel bar. (08 M)
- B. Determine characteristic deflection for the following readings taken on a road having traffic 1800 cvpd. 1.48, 1.62, 1.40, 1.28, 1.32, 1.71, 1.63, 1.22, 1.13, 1.53. (06 M)
- C. Explain the desirable properties of aggregate and discuss any 1 test in detail (06 M)

3. A. Design a pavement for construction of new bypass for single lane having initial traffic 600 CVPD in both directions. Rate of growth is 7.5 %, VDF is 2.5, CBR is 4 %, construction period is 2 years & 'n' is 15 years. Use design chart provided below. (08 M)



- B. Discuss on types of conflict points and measures to reduce it. (06 M)
- C. What is grade compensation? Also, if the ruling gradient on stretch of road is 6 % and radius of road is 60 m, Find the grade compensation to be given and the compensated gradient. (06 M)
4. A. Derive equation for extra widening on curve. Also, for a 7 m wide road having curve of radius 200 m, if the length of wheel base is 6.5 m, find the extra widening required for the design speed of 65 kmph. (08 M)
- B. What are objectives of providing surface drainage? Also discuss modes used for it. (06 M)
- C. Discuss on (06 M)
- i. Radius of relative stiffness
 - ii. Modulus of subgrade reaction
 - iii. Contact pressure and tyre pressure
5. A. A cyclist while travelling on 3 km road observed that he took 6 mins 32 sec however he had a stop for water for 1min 10 sec. He also observed that 25 vehicles had overtaken him however he couldn't overtake any. Further he observed that 280 vehicles pass in opposite direction. Assuming that number of vehicles passing and stopping time in both directions was same, find the average Journey and running speed of the cyclist. (08 M)
- B. If the spacing between contraction joints is 4.2 m, Coefficient of friction between the interfaces is 1.1, Unit weight of cement concrete is 2400 kg/cm^3 , find the stress due to friction. (06 M)
- C. Compare Cement concrete, Bituminous concrete and WBM roads (06 M)
6. A. Write short note on any 3. (15 M)
- i. O&D Survey
 - ii. Benkelman beam
 - iii. 30th Highest Hourly Volume
 - iv. Cutback and emulsion
- B. Answer the following
- i. If the softening point of 2 samples are 32^0 and 60^0 , which sample will you use on site and why? (01 M)
 - ii. Determine Vehicle damage factor for an Autorickshaw with 3 passengers if the standard wheel load is 5100 Kg. (02 M)
 - iii. Discuss on BUC and TDC (02 M)